Translation



PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference P 21466 Gf/a | FOR FURTHER ACTION | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
|---|---|---|
| International application No. PCT/EP99/07101 | International filing date (*day/month/year*) 23 September 1999 (23.09.99) | Priority date (*day/month/year*) 26 October 1998 (26.10.98) |
| International Patent Classification (IPC) or national classification and IPC H04L 1/20, 27/26 | | |
| Applicant ROHDE & SCHWARZ GMBH & CO. KG | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

| Date of submission of the demand | Date of completion of this report |
|---|---|
| 09 May 2000 (09.05.00) | 05 October 2000 (05.10.2000) |
| Name and mailing address of the IPEA/EP<br><br>Facsimile No. | Authorized officer<br><br>Telephone No. |

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/EP99/07101

## I. Basis of the report

1. This report has been drawn on the basis of (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

☒ the international application as originally filed.

☒ the description, pages 1-8, as originally filed,
pages _____, filed with the demand,
pages _____, filed with the letter of _____,
pages _____, filed with the letter of _____.

☒ the claims, Nos. _____, as originally filed,
Nos. _____, as amended under Article 19,
Nos. _____, filed with the demand,
Nos. 1-4, filed with the letter of 03 August 2000 (03.08.2000),
Nos. _____, filed with the letter of _____.

☒ the drawings, sheets/fig 1/2-2/2, as originally filed,
sheets/fig _____, filed with the demand,
sheets/fig _____, filed with the letter of _____,
sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 1-4 | YES |
| | Claims | | NO |
| Inventive step (IS) | Claims | 1-4 | YES |
| | Claims | | NO |
| Industrial applicability (IA) | Claims | 1-4 | YES |
| | Claims | | NO |

2. Citations and explanations

1. The present application is directed to a method for displaying the modulation error of a multicarrier signal. Claim 1 claims a method for displaying the mean modulation error $MER_{RMS}$ of an Orthogonal Frequency Division and Multiplexing (OFDM) multicarrier signal.

2. The applicant acknowledges the **prior art** in the description (see especially page 3, first paragraph).

The disadvantage of the prior art is explained on page 3, second paragraph. Thus the method is known for calculating, with the formula on description page 2, and displaying the modulation error for each *individual* carrier as a numerical value. For multicarrier systems having 1000 or more carriers (for example, DAB = 1536 carriers, DVB = 1705 or 6817 carriers), this type of modulation calculation and single-carrier representation can no longer be used. If each individual carrier of the 6817 carriers of the OFDM signal, for example, were to be calculated with the formula, a relatively complicated computer would be necessary as well as

an especially large amount of storage for storing each carrier's individual summands.

3. The **problem addressed by the invention** (see page 3, third paragraph) is to show a method for easily calculating the modulation error with the least amount of computational complexity. Furthermore, a simple and clear metrological evaluation for all carriers should be possible.

4a. The problem addressed by the invention is solved by the advantageous interaction of the technical features given in Claim 1. The wording of the claim is:

"Method for displaying the mean modulation error $MER_{RMS}$ of an Orthogonal Frequency Division and Multiplexing (OFDM) multicarrier signal
**characterized in that**
a. for each *current* modulation symbol I of each individual carrier k of the multicarrier signal, the square $m_k$ of the error vector is calculated with the equation

$$m_k = |\text{error vector}_k|^2,$$

b. by using the following formula, this value $m_k$ is calculated with the capacity of a storage location, allocated to the same carrier k, of a first storage device (A2) having an equal number of storage locations as the OFDM signal carrier

$$A2_{k,I+1} = \frac{(A2_{k,I} \cdot I + m_k)}{(I + 1)} \quad \text{(iteration formula)}$$

where

$A2_{k,I+1}$: new measurand (time I + 1) that should be filed in storage location k of storage device A2,

$A2_{k,I}$: previous measurand (time I) from storage location k of storage device A2,

$M_k$ current measured squared error for carrier k,

k: carrier number within the OFDM spectrum, increases with frequency, k = 0 ... Kmax,

I: number of the symbol, increases with time, $0 \leq 1$

c. from these storage location values, the mean (percentage) modulation error $MER_{RMS}$ for each carrier is calculated with the formula

$$MER_{RMS,k} = 100 \cdot \frac{\sqrt{A2_k}}{VM} \quad [\%]$$

VM representing the weighted squared mean of the amplitude of all ideal signal states of each used modulation type of a carrier modulated with useful data,

and

d. this $MER_{RMS}$ value is then graphically displayed as an ordinate value with the number of carriers

displayed as an abscissa.

4b. The method described in Claim 1 reveals advantageous effects as described on application pages 3 (last paragraph) to 4 (first paragraph).

The combination of features of Claim 1 makes it possible to *continually* calculate the mean modulation error for the individual carriers by means of a simple storage device. This method allows for extremely brief calculation times and is sufficient for a storage device having the least possible extent of storage.

5. The totality of all technical features of Claim 1 is **not** disclosed in any of the international search report documents.

The subject matter of Claim 1 therefore fulfils the criteria for novelty (PCT Article 33(1) and (2)).

The documents cited in the international search report also do **not** render obvious the subject matter of Claim 1. Therefore the requirement for inventive step is fulfilled for the subject matter claimed (PCT Article 33(1) and (3)).

The subject matter of Claim 1, among others, is industrially applicable in metrological applications in multicarrier systems, accordingly fulfilling the industrial applicability requirements of PCT Article 33(1) and (4).

6. Dependent Claims 2 to 4 specify special interpretations of the method according to Claim 1

that likewise satisfy the requirements for novelty, inventive step, and industrial applicability (PCT Article 33(2) to (4)).

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

1. Contrary to PCT Rule 5.1(a)(ii), the description does not cite **D1** and **D4** or indicate the **relevant prior art** disclosed therein.

   **D1** FR-A-2 742 613 (FRANCE TELECOM) 20 June 1997,

   **D4** "HP introduces industry's first test solution for European DBV-T Services." HP PRESS RELEASES, [Online] 15 July 1998 (1998-07-15), XP002130133 Calif. Retrieved from the Internet:
   URL: www.tm.agilent.com/tmo/press/English/PRTME600806.html
   [retrieved on 2000-02-09].

2. The **description** (see page 3, penultimate paragraph) has not been brought into line with the valid claims. Accordingly, the requirements of PCT Rule 5.1(a)(iii) are not fulfilled.

3. The present description does not contain brief descriptions of the drawings (Sheets 1/2 to 2/2). Accordingly, the requirements of PCT Rule 5.1(a)(iv) are not fulfilled (see also PCT Guidelines, Chapter II-4.7).

4. The present application does not fulfil the requirements of PCT Rule 11, especially not in light of the requirements of PCT Rule 11.9(d) [character size]. Whether regarding the original documents or document WO-A-00/25471, the

VII. Certain defects in the international application

application contains parts that are barely legible (see page 5, below; page 6) thus raising doubts about the informational content. Therefore it is suggested that the specified parts be filed as easily legible replacement pages during the national or regional phase of the proceedings.

5. The description has several typographical errors (see page 1, lines 6 and 9) that should be corrected:

- Modulationsfehler,

- Division und Multiplexing.